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LONG DATABASE REPORT ECOINFORMATICS

A National Vegetation Plot Database for Great Britain

Zeke Marshall[1,2], Claire Wood[1], Ed Mountford[3], John Rodwell[4], Ian Strachan[5], Oli Pescott[1], Irina Tatarenko[6], John Hodgson[7,8], Kevin Walker[9], James Latham[10], Lindsay Maskell[1], Andrea J. Britton[11], Robin J. Pakeman[11], Tom Dargie[12], Ruth Mitchell[11], Laurence Jones[13], Alison Hester[11], Louise Ross[14], Sarah Dalrymple[15], Carly Stevens[2], Ed Rowe[13], Frances McCullagh[16], Stephen Willis[17], Rob Marrs[18], Lisa Norton[1], Simon M. Smart[1]

1 *Biodiversity and Land Use, UK Centre for Ecology & Hydrology, Lancaster, UK*
2 *Lancaster Environment Centre, Lancaster University, Lancaster, UK*
3 *Joint Nature Conservation Committee, Peterborough, UK*
4 *Lancaster, UK*
5 *NatureScot, Roy Bridge, UK*
6 *School of Environment, Earth & Ecosystem Sciences, The Open University, Milton Keynes, UK*
7 *School of Biosciences, The University of Sheffield, Sheffield, UK*
8 *School of Archaeology, University of Oxford, Oxford, UK*
9 *Botanical Society of Britain and Ireland, Harrogate, UK*
10 *Natural Resources Wales, Conwy, UK*
11 *Ecological Sciences, The James Hutton Institute, Aberdeen, UK*
12 *Boreas Ecology, Dornoch, UK*
13 *Land-Atmosphere Interactions, UK Centre for Ecology & Hydrology, Bangor, UK*
14 *Rural Land Use, Scotland's Rural College, Aberdeen, UK*
15 *School of Biological and Environmental Sciences, Liverpool John Moores University, Liverpool, UK*
16 *Natural England, York, UK*
17 *Department of Biosciences, Durham University, Durham, UK*
18 *School of Environmental Sciences, University of Liverpool, Liverpool, UK*

Corresponding author: Zeke Marshall (zekmar@ceh.ac.uk)

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Abstract

The GBNVPD (GIVD-code EU-GB-007) is the new centralised repository for the collection and storage of standardised vegetation plot data in Great Britain and the Crown Dependencies. The initial version of the GBNVPD (v1.0) described in this long database report comprises data from 63 individual sources and contains 277,070 samples from 200,733 plots, with a total of 4,463,300 occurrences of 4,086 accepted taxa (3,464 accepted species), surveyed between 1949 and 2024. Of the 63 constituent datasets 52 are newly submitted to the EVA and 9 to ReSurveyEurope. The database is available under a discretionary mixed-access regime and will be maintained and updated continuously in response to further digitisation of historic paper records, collection of pre-existing digitised survey data, and addition of future survey data.

Abbreviations: EVA = European Vegetation Archive; GB = Great Britain; GBNVPD = National Vegetation Plot Database for Great Britain and the Crown Dependencies; NVC = National Vegetation Classification; UKCEH = United Kingdom Centre for Ecology and Hydrology; UKSI = United Kingdom Species Inventory.

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Keywords

European Vegetation Archive (EVA), National Vegetation Classification (NVC), ReSurveyEurope, vegetation plot database, vegetation survey

GIVD Fact Sheet:

GIVD Database ID: EU-GB-007			**Last update:** 2025-08-31
GBNVPD	**Web address:**		
Database manager(s): Zeke Marshall (zekmar@ceh.ac.uk)			
Owner: The UK Centre for Ecology and Hydrology manages the GBNVPD as part of a collaborative consortium of data contributors.			
Scope: The GBNVPD contains vegetation plot data from Great Britain, the Isle of Man, the Bailiwick of Guernsey, and the Bailiwick of Jersey. At present only non-experimental plots are collected, otherwise all other vegetation plots are within the scope of the GBNVPD provided that there is confidence in the reliability of vascular plant identification.			
Abstract: The GBNVPD (GIVD-code EU-GB-007) is the new centralised repository for the collection and storage of standardised vegetation plot data in Great Britain and the Crown Dependencies. The initial version of the GBNVPD (v1.0) described in this long database report comprises data from 63 individual sources and contains 277,070 samples from 200,733 plots, with a total of 4,463,300 occurrences of 4,086 accepted taxa (3,464 accepted species), surveyed between 1949 and 2024. Of the 63 constituent datasets 52 are newly submitted to the EVA and 9 to ReSurveyEurope. The database is available under a discretionary mixed- access regime and will be maintained and updated continuously in response to further digitisation of historic paper records, collection of pre-existing digitised survey data, and addition of future survey data.			
Availability: according to a specific agreement	**Online upload:** no	**Online search:** no	
Database format(s): other, DuckDB	**Export format(s):** Excel, CSV file, plain text file		
Plot type(s): normal plots, nested plots, time series	**Plot-size range (m²):** 0.04 to 900		
Non-overlapping plots: 200733	**Estimate of existing plots:** 200733	**Completeness:** 100%	**Status:** completed and continuing
Total no. of plot observations: 277070	**Number of sources (biblioreferences, data collectors):** 63		**Valid taxa:** 4086
Countries (%): GB: 100			
Formations: Forest: 10% // Non Forest: 86%			
Guilds: all vascular plants: 83%; bryophytes (terricolous or aquatic): 12%; lichens (terricolous or aquatic): 1%; non-terricolous taxa (epiphytic, saxicolous, lignicolous): 1%			
Plot size categories (%): < 1 m2: 17.89%; 1-10 m2: 52.9%; 10-100 m2: 4.37%; 100-1000 m2: 5.7%; unknowmn: 19.14%;			
Environmental data (%): altitude: 30.7; slope aspect: 37.7; slope inclination: 25.1; soil pH: 10.8			
Performance measure(s): presence/absence only: 2.89%; cover: 92.6%; number of individuals: 4.41%; other: 0.10%			
Geographic localisation: GPS coordinates (precision 25 m or less): 36.22%; point coordinates less precise than GPS, up to 1 km: 36.94%; small grid (not coarser than 10 km): 23.86%; political units or only on a coarser scale (above 10 km): 2.99%			
Sampling periods: 1940-1949: 0.04%; 1950-1959: 0.45%; 1960-1969: 2.05%; 1970-1979: 14.86%; 1980-1989: 5.73%; 1990-1999: 23.43%; 2000-2009: 17.19%; 2010-2019: 20.82%; after 2020: 6.18%; unknown: 9.24%			
Information as of 2025-08-31; further details and future updates available from http://www.givd.info/ID/EU-GB-007			

Introduction

Outline

Despite a rich history of vegetation science in Great Britain (GB) (Tansley et al. 1911; Sheail 1987; Hutchings et al. 2012) and ongoing long-term national-scale monitoring programs such as the Countryside Survey (Wood et al. 2017), there is currently no central database for the standardisation and storage of vegetation plot data in GB (Pescott et al. 2021). In contrast, actively maintained national vegetation plot databases make key, continued contributions to regional and global databases such as the European Vegetation Archive (EVA) (Chytrý et al. 2016), ReSurveyEurope (Knollová et al. 2024), and sPlot (Bruelheide et al. 2019). In turn, these databases provide an essential resource for vegetation science, for example by: facilitating the identification of diagnostic species in EUNIS habitats (Chytrý et al. 2020), underpinning analyses of biogeographic patterns (Midolo et al. 2024), and contributing to analyses of the validity of phytosociological syntaxa (Preislerová et al. 2024).

History

The development of a national vegetation plot database for Great Britain began in 1981, following discussions between the National Vegetation Classification (NVC) team led by John Rodwell and the Nature Conservancy Council regarding the aftercare of data being produced during the NVC project. These discussions led to the creation of a database held by the Unit of Vegetation Science at Lancaster University, which was formed from the approximately 13,000 plots surveyed during the NVC project and additional data supplied from collaborators across GB. This database originally consisted of 31,450 plots but was later expanded to include additional datasets as listed in Rodwell et al. (1993) and subsequently registered in the Global

Index of Vegetation Plot Databases (GIVD) (Dengler et al. 2011, 2012b) as the first database from GB (GIVD-code EU-GB-001). However, as noted in Rodwell (2018) *"...aftercare of the [NVC] project deliverables has been limited. Except for particular groups of vegetation types, new data have not been formally quality-controlled and incorporated into any kind of UK national vegetation database"*.

In addition to this database and in the interim period before the completion of the NVC, a project to develop a register of permanent vegetation plots was also conducted (Hill and Radford 1986), but the registered data were never collated and standardised. Two major, but incomplete, projects to collate vegetation plot data at a national scale have since followed. First was the Biological Inventory of Georeferenced Species and Habitat Occurrences over Time (BIGSHOT) project initiated by Mark Hill, which did not secure funding but did lead to the collation of a small quantity of unstandardised vegetation plot datasets. Second, was a project to create a national vegetation plot database for Scotland initiated by Ian Strachan and commissioned by Scottish Natural Heritage (now NatureScot); this was near completion, with all plot data standardised for entry into Turboveg (Hennekens and Schaminée 2001), but never published. Most recently, a resurgence in vegetation plot data rescue efforts at the United Kingdom Centre for Ecology and Hydrology (UKCEH) (Wood 2021; Wood et al. 2025) has provided a firm foundation for the realisation of a centralised national vegetation plot database.

Aims

In response to the need for an actively maintained database, this paper provides an overview of the creation of a national vegetation plot database for Great Britain and the Crown Dependencies (GBNVPD) - GIVD-code EU-GB-007 - which incorporates and acts as the successor to the UK national vegetation plot database developed by Rodwell et al. (1993). The constituent data, database structure, management, and future development of the database are also described.

Methodology

Scope

To ensure as much vegetation plot data as possible was collected, standardised, and preserved only three criteria for determining the suitability for inclusion into the GBNVPD were applied: 1) confidence in the reliability of the survey methodology, 2) confidence in the reliability of the identification of vascular plant taxa, and 3) absence of experimental treatments. However, in some cases control plots were included from experimental datasets which sampled phytosociological units that were otherwise not well represented in the GBNVPD contemporarily, such as the *Arenarion norvegicae* Nordhagen 1935 communities surveyed by Dalrymple et al. (2021). Otherwise, plots of any size were accepted, with any number of attributes, and absent or incomplete coverage of bryophyte and lichen taxa; see Table 1 below and Suppl. material 1: tables S2, S3 for an overview of the coverage of plot attributes in the database. The geographic scope of the database encompasses Great Britain and the Crown Dependencies of the Isle of Man, the Bailiwick of Guernsey, and the Bailiwick of Jersey. The GBNVPD does not incorporate data from Northern Ireland, or from the Republic of Ireland, which is covered by the Irish Vegetation Database (Weekes and FitzPatrick 2010; FitzPatrick and Kingston 2012).

Standardisation

Following the recommendation of Chytrý et al. (2025) to adhere to a modern taxonomic resource and acknowledging that taxon names in the GBNVPD must adhere to the requirements of Jansen and Dengler (2010), all taxon names in the original datasets were aligned to version 20241114a of the United Kingdom Species Inventory (UKSI) (Raper 2015). Of particular importance given the number and various ages of the constituent datasets was fulfilling requirement two (*Unambiguous recording of different taxon views*), to achieve this the original taxon concept names in the constituent datasets were preserved where valid, which was mostly achievable owing to the comprehensiveness of the UKSI; a lookup to the latest accepted names in the UKSI was also provided (see the Structure section). Additionally, a lookup is also provided to the EuroSL (Dengler et al. 2012a; Jansen 2024) taxon names and ID codes, where equivalent taxon concepts exist in EuroSL.

The GBNVPD plots were matched against three systems: EuroVegChecklist syntaxa (Mucina et al. 2016), using the R implementation of the EUNIS expert system (Bruelheide et al. 2021); GB broad habitats (Jackson 2000), using a count of indicator species (Hill et al. 2004); and NVC communities, using pseudo-quadrat methodology implemented in RMAVIS (Marshall et al. 2024). Five cover-abundance scales were present in the constituent datasets (DAFOR, Domin, percentage cover, rooted frequency, and nested presences). All original cover values were retained as per the EVA convention. The DAFOR and Domin cover values were converted to percentage cover (see Suppl. material 1: tables S4, S5), whilst the rooted frequency abundance values present in the Unit of Comparative Plant Ecology survey and nested presences in the Lake District Semi-Natural Woodlands datasets were not converted.

Table 1. The total percentage of samples with selected plot attributes.

Year	Syntaxon	Coordinates	Precision	Slope	Aspect	Altitude	Plot Dimensions
91.2%	22.8%	94.3%	97.0%	25.1%	39.7%	33.6%	54.2%

Structure

The database is simple, consisting of ten tables at present: 1) 'plot_species', which contains the presence and cover of taxa; 2) 'plot_attributes', which contains additional information for each plot such as location, date of survey, and plot dimensions; 3) 'nvc_fits', which contains the top-five fitting NVC communities; 4) 'bh_fits', which contains the top-five fitting broad habitats; 5) 'evc_fits', which contains the top-fitting EuroVegChecklist syntaxa; 6) 'eurosl_lookup', which contains a lookup between the accepted taxon concepts in the GBNVPD and EuroSL; 7) 'uksi_lookup', which contains a lookup between the taxa in 'plot_species' and the accepted taxon names in the UKSI; 8) 'uksi_backbone', which contains the accepted taxa in the UKSI with parent taxa; 9) 'dataset_metadata', which contains the dataset names, codes, licences, access regimes, and source keys; and 10) 'dataset_sources', which contains information on the source and associated publications for the constituent datasets. A schematic of the database structure can be seen in Section 3 of the Suppl. material 1.

Management

The original constituent datasets and preparatory methods are versioned and held internally by UKCEH. The GBNVPD itself is also versioned and is stored as a DuckDB database (Raasveldt and Mühleisen 2019) held internally by UKCEH. Version 1.0 (v1.0) of the GBNVPD, as described in this paper, has also been submitted to the EVA and ReSurveyEurope (18/08/2025) after redacting datasets already present in the EVA and ReSurveyEurope to prevent duplication (Table 2). Individually, the constituent datasets have a mixture of licences and access regimes, however, for inclusion into the GBNVPD all datasets, unless publicly published under an open-access and permissive licence or owned by UKCEH, have a completed terms of use form (see Suppl. material 2).

Content

Version 1.0 of the GBNVPD contains 277,070 samples from 200,733 plots (208,399 plots when including all nests), with a total of 4,463,300 occurrences of 4,086 accepted taxa (3,464 accepted taxa at the species aggregate rank and below). Currently 63 datasets constitute the GBNVPD (see Suppl. material 1: table S1), with the top-ten and 'other' datasets visualised in Figure 1. The plots were surveyed between 1949 and 2024, with approximately 40,000–60,000 plots surveyed in each of the decades of the 1970s (predominantly during the first Countryside Survey and NVC surveys), 1990s, 2000s, and 2010s with a period of relative inactivity in the 1980s (Figure 2). Recently, the reduction in the number of plot types surveyed during the Countryside Survey (post-2007) and reduction in large-scale NVC surveys has resulted in a greater role of volunteer-based initiatives such as the National Plant Monitoring Scheme (Pescott et al. 2019).

The samples are distributed across the UK (Figure 3) with a mean of 10 samples per km^2, but with a noticeable bias towards the Sheffield region which was sampled heavily during the Unit of Comparative Plant Ecology surveys (Grime 1988).

The precision of the plot coordinates varies between 1 m and 10000 m (Figure 4), with 22.5% of samples restricted to 10000 m, the result of the requirement to obscure the locations of the GB Countryside Survey, Glastir Monitoring and Evaluation Programme, and Cumbria Survey datasets. One dataset, Birse and Robertson, is restricted to a precision of 1000 m, representing 2.9% of the samples.

Based on the top-fitting match to NVC units the GBNVPD plots encompass all habitats as defined by the NVC (see Figure 5), with the most frequently surveyed habitats consisting of: mesotrophic grasslands (29.7%), woodlands (12.7%), mires (11.1%), open vegetation (9.7%), and calcifugous grasslands and montane communities (8.3%). The prevalence of mesotrophic grassland plots is the result of the large contribution of the Floodplain Meadows dataset and the extensive sampling of lowland improved grassland

Table 2. The overlap between datasets in the GBNVPD which are either already registered in GIVD, present in EVA, and/or present in ReSurveyEurope.

Source	GIVD Code	In EVA	In ReSurveyEurope	ReSurveyEurope Code	Notes
Begin Acid Grasslands		✓			Included within GrassPlot (00-00-008)
Birse and Robertson	EU-GB-006	✓	✓	UK_0003	GIVD notes 5878 plots, last updated 2023-10-12
Countryside Survey	EU-GB-003				GIVD notes 49165 plots, last updated 2015-09-23
Environmental Change Network	EU-GB-002				GIVD notes 3783 plots, last updated 2015-09-23
Floodplain Meadows Partnership	EU-GB-004	✓	✓	UK_0001	GIVD notes 8938 plots, last updated 2019-04-11
Grime Sheffield Area Survey		✓			Included within GrassPlot (00-00-008)
MAFF meadows survey		✓			Included in the NVC database (EU-GB-001).
Malham Tarn NNR		✓			Included in the NVC database (EU-GB-001).
Malloch additional NVC plots		✓			Included in the NVC database (EU-GB-001).
Miscellaneous additional NVC plots		✓			Included in the NVC database (EU-GB-001).
National Vegetation Classification	EU-GB-001	✓			GIVD notes 35000 plots, but 42834 plots in the EVA, last updated 2015-09-23
Outer Hebrides Semi-Natural Grasslands		✓			Included within GrassPlot (00-00-008)
Scottish Coastal Survey	EU-GB-005	✓	✓	UK_0002	GIVD notes 3969 plots, last updated 2023-10-12

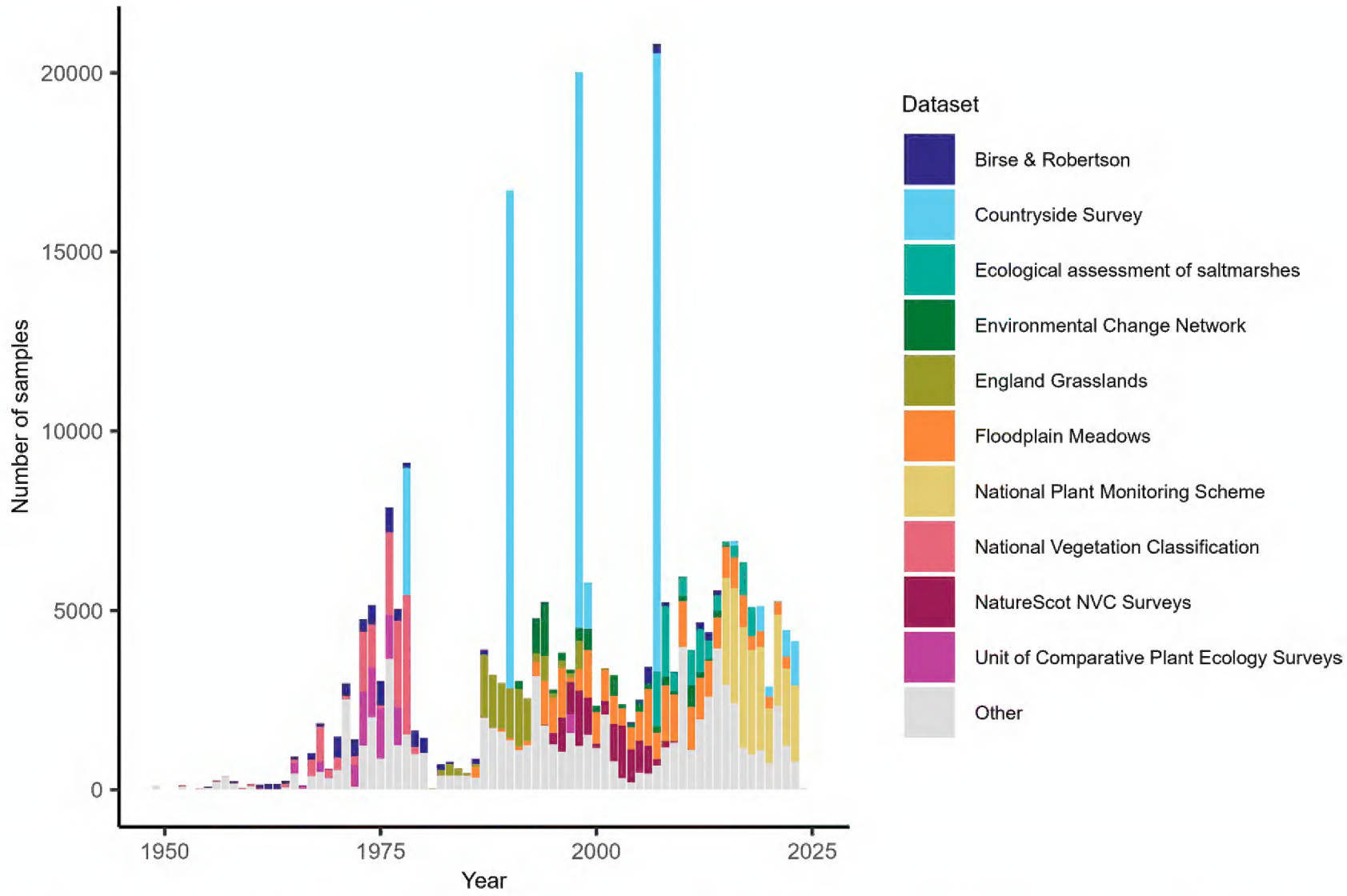

Figure 1. The number of vegetation plots recorded by year for the top ten largest and other datasets. Note that the samples include plots resurveyed in the same year (e.g. in NPMS) and multiple nest levels (e.g. X1 (2 m × 2 m) and X5 (14.14 m × 14.14 m) as in Countryside Survey) separately, as per the EVA convention for recording 'plot observations'.

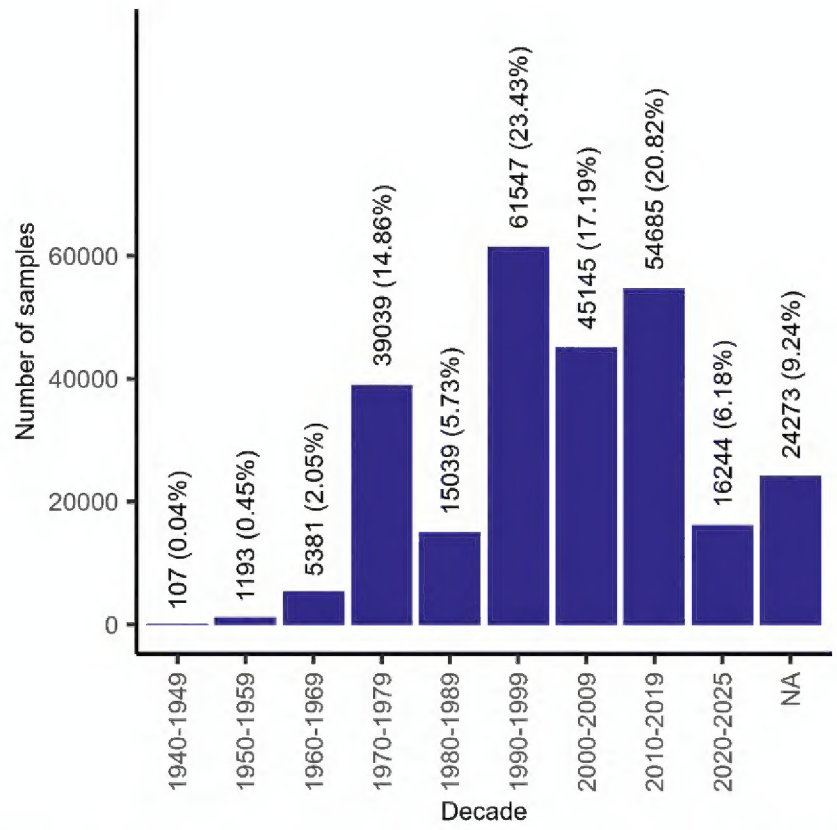

Figure 2. The total number of samples in the GBNPVD by decade.

in national monitoring schemes such as the Countryside Survey. Aquatic habitats appear to be under-represented with only 700 samples as the top match, but this is certainly an underestimate as 1139 samples were used to define the original NVC communities (Rodwell 1995).

The overall species richness (= *species/plot area*) of the samples is low (Figure 6), with 70.4% of plots over 1 m^2 containing only 0–5 species per m^2; with the most frequent taxa in the database consisting of ubiquitous species with broad niches most commonly found in mesotrophic grasslands, namely: *Holcus lanatus* (1.9%), *Agrostis stolonifera* (1.5%), *Anthoxanthum odoratum* (1.5%), *Plantago lanceolata* (1.4%), *Trifolium repens* (1.3%), *Festuca rubra* agg. (1.3%), *Agrostis capillaris* (1.2%), *Ranunculus repens* (1.2%), *Rumex acetosa* (1.1%), and *Lolium perenne* (1.1%). The prevalence of these taxa and low species richness is reflective of the high number of samples from lowland semi-improved and improved grassland, in particular the NVC communities MG6 and MG7 (which are of the class *Molinio-Arrhenatheretea* Tx. 1937, most frequently the alliance *Cynosurion cristati* Tx. 1947). Overall, the prevalence of taxa in the database is highly skewed; only 78 taxa represent 50% of occurrences in the database (Figure 7) and there is a long tail of low-frequency taxa, with over 50% of taxa occurring less than 50 times (Figure 8). This distribution, whilst not usual, highlights the value of targeted vegetation survey efforts such as the Botanical Society of Britain and Ireland's Threatened Plants Project, without which many rare and scarce taxa would be poorly represented (Walker et al. 2017).

The coverage of plot attributes is patchy, with a high proportion of plots containing the year of survey (91.2%), plot coordinates (94.3%), and coordinate precision (97%); otherwise the percentage of samples with desirable attributes such as slope, aspect, altitude is low, see Table 1 and Suppl. material 1: table S2. Whilst the coverage of soil attributes is also low (see Table 3), the majority of plots with soils data are derived from surveys which adopted stratified sampling protocols such as the Countryside Survey (Wood et al. 2017), as such the vegetation plots containing co-located soils data are distributed across a broad range of habitats and geographic locations. Work to gap-fill each of the consistuent datasets plot attributes is ongoing.

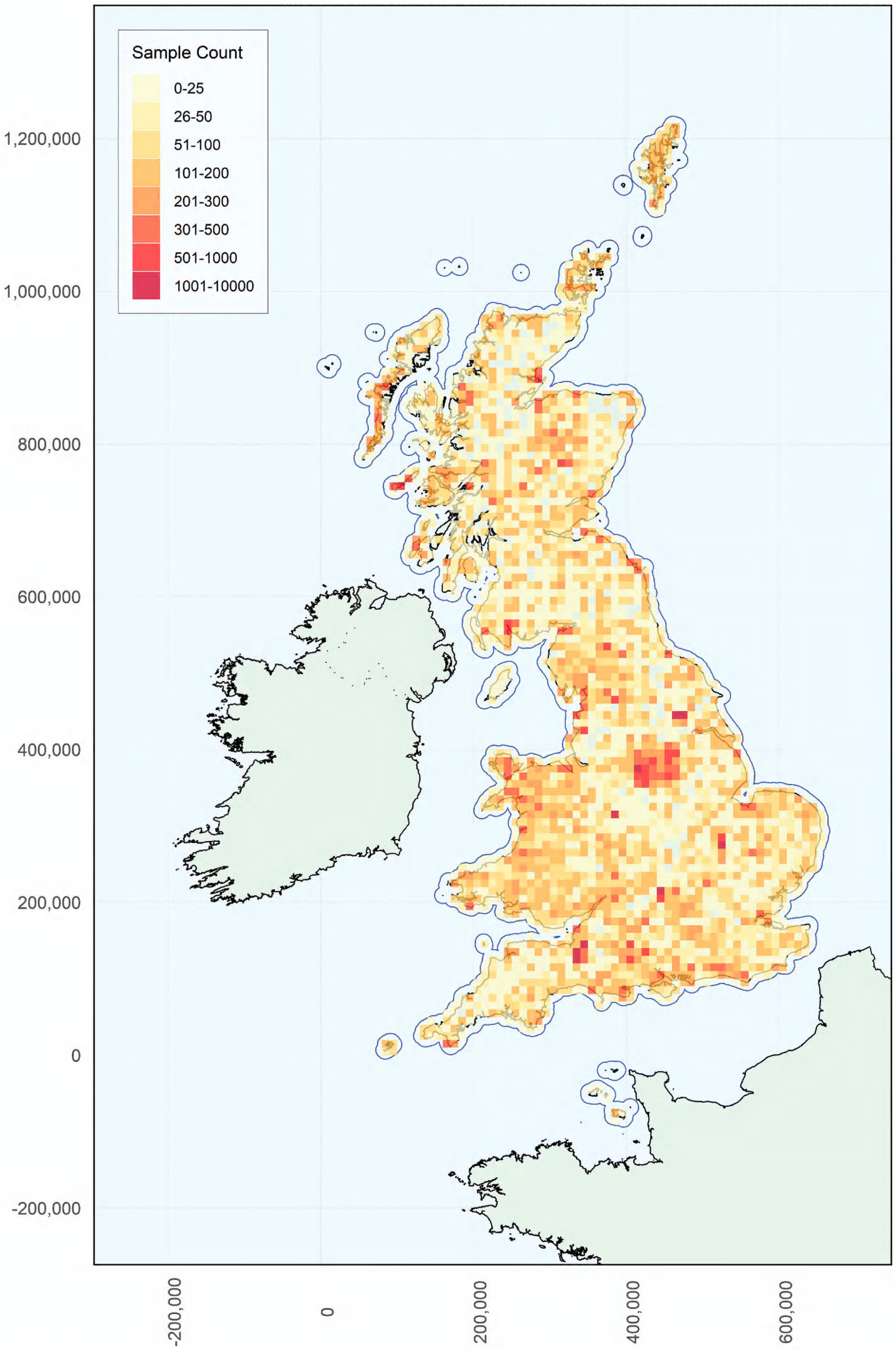

Figure 3. The spatial density of vegetation plots present in GBNVPD at a resolution of 10 km. The geographic scope of the GBNVPD is outlined in blue (OSGB36, EPSG:27700).

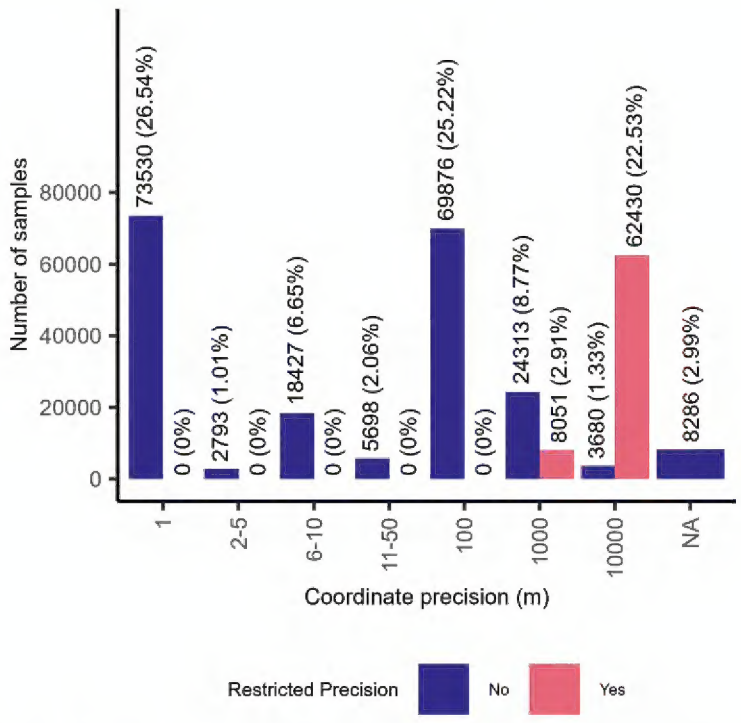

Figure 4. The number of samples by coordinate precision category, grouped by whether the coordinate locations are obscured and therefore have a restricted precision.

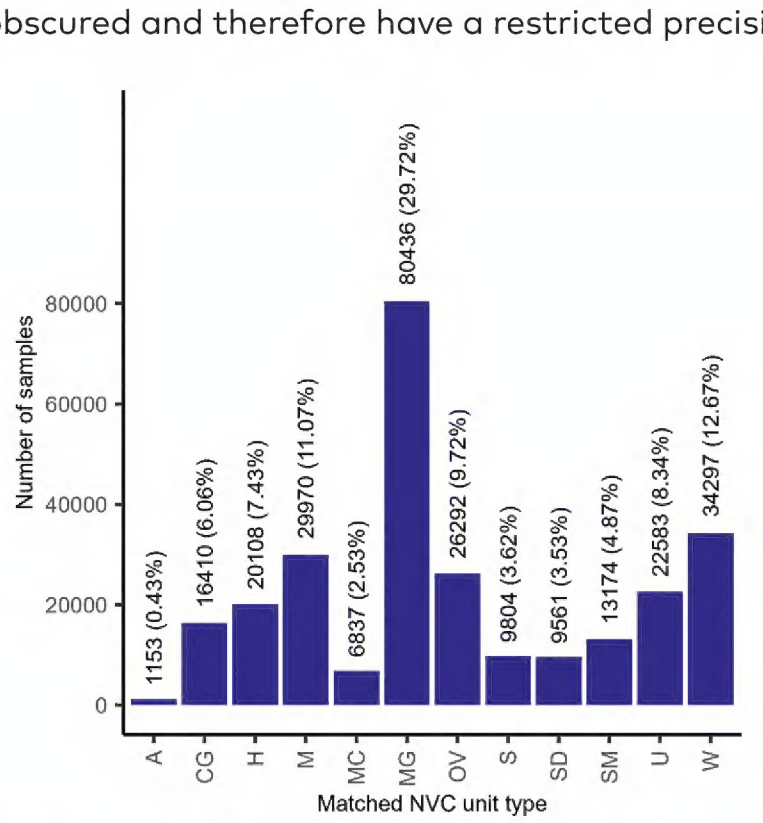

Figure 5. The number of samples by top-fitting NVC unit type, which are: A - Aquatic communities, CG - Calcicolous grasslands, H - Heaths, M - Mires, MC - Maritime cliff communities, MG - Mesotrophic grasslands, OV - Vegetation of open habitats, S - Swamps and tall-herb fens, SD - Shingle, strandline, and sand-dune communities, SM - Salt-marsh communities, U - Calcifugous grasslands and montane communities, and W - Woodland and scrub communities.

As of 2025 four datasets from Great Britain are included in the EVA (Chytrý et al. 2016), with GIVD-codes EU-GB-001, EU-GB-004, EU-GB-005, and EU-GB-006 (See Table 2); these datasets represent 82,565 (29.8%) of the samples in the GBNVPD. The GBNVPD therefore makes available 194,519 samples from 52 datasets to the EVA and 97,099 samples from 9 datasets to ReSurveyEurope, for the first time.

Future development

There are several areas for future development of the GBNVPD. First is the integration of new vegetation plot data from ongoing monitoring programs including the Environment and Rural Affairs Monitoring and Modelling

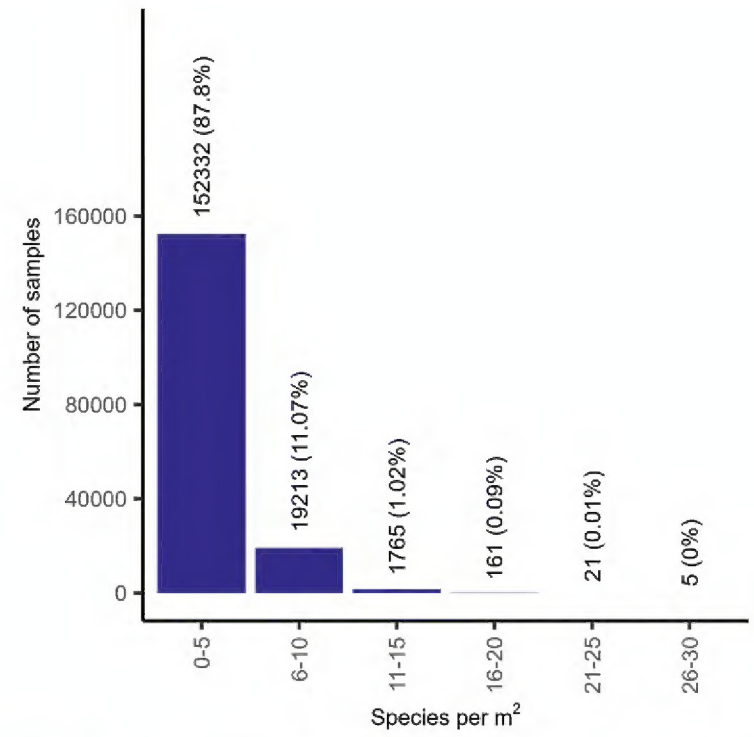

Figure 6. The number of samples binned by the number of species per m^2, for plots greater than 1 m^2 in area, for samples where the plot area is known.

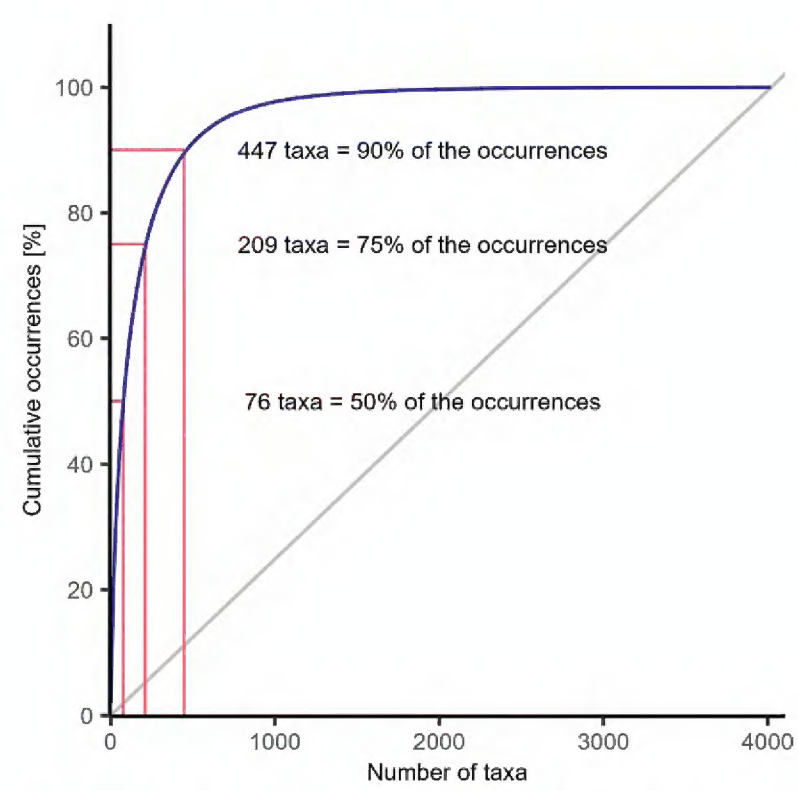

Figure 7. The percentage cumulative taxon occurrences in the GBNVPD, plotted against the number of taxa ordered by number of individual occurrences, most frequent to least frequent. The grey line represents the hypothetical where the frequency of occurrences of all taxa are equal.

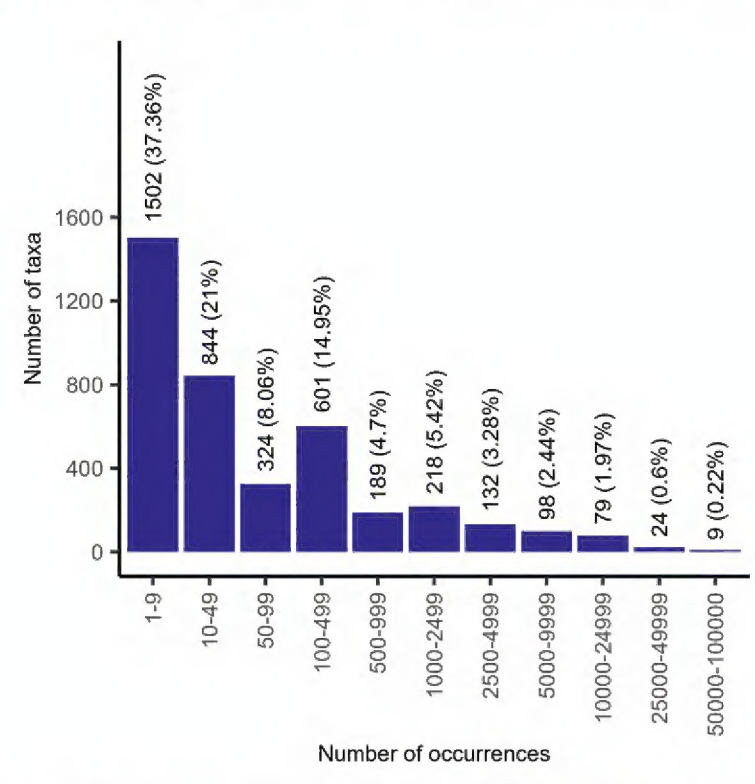

Figure 8. The number of taxa in the GBNVPD grouped by the number of occurrences.

Table 3. Summary statistics for key soil properties in the GBNVPD.

Variable	Units	Coverage (%)	Minimum	Mean	Maximum
Bulk Density	g soil / cm^3	3.7	0.02	0.71	1.95
Carbon Content	g C / 100 g of oven dry soil	2.1	0.02	14.70	66.60
Organic Matter Content	g LOI / 100 g of oven dry soil	7.3	0.19	25.01	99.00
Gravimetric water content	g water/g of oven dry soil	1.1	0.01	2.44	30.10
Gravimetric water content	g water/g of field moist soil	0.9	0.01	0.40	1.00
Moisture Volume	m^3/m^3	4.4	0.00	25.40	98.07
Nitrogen Content	g N / 100 g of oven dry soil	3.6	0.01	0.79	18.40
Total soil phosphorus content	mg P / kg of oven dry soil	2.2	0.00	968.76	5426.80
Soil pH (method unspecified)	-	10.8	0.00	5.11	10.20
Soil pH in Calcium Chloride ($CaCl_2$)	-	2.1	1.00	4.55	7.82
Soil pH in water	-	7.7	1.00	5.45	9.97
Olsen-phosphorus	mg P / kg of oven dry soil	2.1	1.00	34.27	380.00

Programme (ERAMPP) of Wales, the England Ecosystem Survey, the GB Countryside Survey, Natural Resources Wales Lowland Peatland Survey, Natural England Long-Term Monitoring Network, National Plant Monitoring Scheme, and Environmental Change Network. Second, is the continued rescue of historic datasets; for example, data from major national surveys such as the England sand dune survey (Radley 1994) and Wales sand dune survey (Dargie 1995) need to be obtained and digitised. Third, is gap-filling plot attributes for data which has been incorporated into v1.0 of the GBNVPD. Fourth, is the integration of vegetation survey data using alternative survey methods such as the Stevens (2025) limestone pavement grike survey data. Fifth, is the integration of experimental plot data, for which a more sophisticated database structure must be designed.

Conclusion

The GBNVPD succeeds the UK national vegetation plot database developed by Rodwell et al. (1993) as the centralised database for the storage and management of standardised vegetation plot data in Great Britain. The GBNVPD has been incorporated into the EVA and RESurveyEurope and will be updated continuously through the continued rescue of historic datasets and integretation of future survey data.

Author contributions

Author contributions are outlined in Table 4.

Table 4. Author contributions following CRediT (contributor roles taxonomy) (NISO CRediT Working Group 2022).

	Conceptualisation	Data curation	Formal analysis	Funding acquisition	Investigation	Methodology	Project administration	Resources	Software	Supervision	Validation	Visualisation	Writing - original draft	Writing - review & editing
Zeke Marshall	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Claire Wood		●			◒	◒								◒
Ed Mountford		●	◒		◒		◒			◒				◒
John Rodwell	●	●	◒		◒	◒				◒				◒
Ian Strachan	◒	●			◒									◒
Oli Pescott		●			◒									◒
Irina Tatarenko		●												◒
John Hodgson		●												◒
Kevin Walker		●												◒
James Latham		●												◒
Lindsay Maskell		●	◒											◒
Andrea J. Britton		●												◒
Robin J. Pakeman		●												◒
Tom Dargie		●												◒
Ruth Mitchell		●												◒
Laurence Jones		●												◒
Alison Hester		●												◒
Louise Ross		●												◒
Sarah Dalrymple		●								◒				◒
Carly Stevens		●								◒				◒
Ed Rowe		●												◒
Frances McCullagh		●												◒
Stephen Willis										◒				◒
Rob Marrs														◒
Lisa Norton		●												◒
Simon M. Smart		●	●		◒	◒				◒				◒

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E-mail and ORCID

Zeke Marshall (Corresponding author, zekmar@ceh.ac.uk), ORCID: https://orcid.org/0000-0001-9260-7827
Claire Wood (clamw@ceh.ac.uk), ORCID: https://orcid.org/0000-0002-0394-2998
Ed Mountford (ed.mountford@jncc.gov.uk)
John Rodwell (johnrodwell@tiscali.co.uk), ORCID: https://orcid.org/0000-0001-7790-3089
Ian Strachan (imstrachan55@gmail.com)
Oli Pescott (olipes@ceh.ac.uk), ORCID: https://orcid.org/0000-0002-0685-8046
Irina Tatarenko (irina.tatarenko@open.ac.uk), ORCID: https://orcid.org/0000-0001-6835-2465
John Hodgson (arch0493@ox.ac.uk)
Kevin Walker (kevin.walker@bsbi.org), ORCID: https://orcid.org/0000-0002-5751-8623
James Latham (james.latham@cyfoethnaturiolcymru.gov.uk)
Lindsay Maskell (lcma@ceh.ac.uk), ORCID: https://orcid.org/0000-0003-4006-7755
Andrea J. Britton (andrea.britton@hutton.ac.uk), ORCID: https://orcid.org/0000-0002-0603-7432
Robin J. Pakeman (robin.pakeman@hutton.ac.uk), ORCID: https://orcid.org/0000-0001-6248-4133
Tom Dargie (drtom.dargie@gmail.com), ORCID: https://orcid.org/0009-0009-8472-5204
Ruth Mitchell (ruth.mitchell@hutton.ac.uk), ORCID: https://orcid.org/0000-0001-8151-2769
Laurence Jones (lj@ceh.ac.uk), ORCID: https://orcid.org/0000-0002-4379-9006
Alison Hester (alison.hester@hutton.ac.uk), ORCID: https://orcid.org/0000-0002-2407-1474
Louise Ross (louise.ross@sruc.ac.uk), ORCID: https://orcid.org/0000-0003-1358-9814
Sarah Dalrymple (S.E.Dalrymple@ljmu.ac.uk), ORCID: https://orcid.org/0000-0002-6806-855X
Carly Stevens (c.stevens@lancaster.ac.uk), ORCID: https://orcid.org/0000-0002-2390-1763
Ed Rowe (ecro@ceh.ac.uk), ORCID: https://orcid.org/0000-0003-4784-7236
Frances McCullagh (frances.mccullagh@naturalengland.org.uk), ORCID: https://orcid.org/0000-0000-0000-0000
Stephen Willis (s.g.willis@durham.ac.uk), ORCID: https://orcid.org/0000-0002-8656-5808
Rob Marrs (calluna@liverpool.ac.uk), ORCID: https://orcid.org/0000-0002-0664-9420
Lisa Norton (lrn@ceh.ac.uk), ORCID: https://orcid.org/0000-0002-1622-0281
Simon M. Smart (ssma@ceh.ac.uk), ORCID: https://orcid.org/0000-0003-2750-7832

Supplementary material

Supplementary material 1
Data sources and additional statistics (.pdf).
Link: https://doi.org/10.3897/VCS.160378.suppl1

Supplementary material 2
Permissions form (.pdf).
Link: https://doi.org/10.3897/VCS.160378.suppl2